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EXAMINER

RUGGLES, JOHN S

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JASON M. BENZ

Appeal 2008-4930
Application 10/707,908
Technology Center 1700

Decided: November 19, 2008

Before EDWARD C. KIMLIN, TERRY J. OWENS, and
PETER F. KRATZ, *Administrative Patent Judges*.

KIMLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1, 3-5, 8, 10-12, 15, 17, 18, and 21-26. Claim 1 is illustrative:

1. A method of forming a phase shift mask, said method comprising:
forming an opaque layer on a transparent substrate;

performing a first patterning of said opaque layer to expose a first region of said transparent substrate, wherein said first region comprises an uninterrupted rectangular surface;

etching said first region of said transparent substrate to create a phase shift region within said transparent substrate; and

performing additional patterning of said opaque layer to expose a second region of said transparent substrate, such that said second region comprises a similar shape and size as said first region, wherein said second region is adjacent said first region, and wherein said additional patterning process enlarges an opening formed in said first patterning process.

The Examiner relies upon the following references as evidence of obviousness:

Dao	US 5,302,477	Apr. 12, 1994
Tzu	US 5,888,678	Mar. 30, 1999
Levenson	US 6,251,549 B1	Jun. 26, 2001
Rolfson	US 6,395,432 B1	May 28, 2002
Schroeder	US 6,605,396 B2	Aug. 12, 2003
Sandstrom	US 6,605,816 B2	Aug. 12, 2003

Appellant's Admitted Prior Art	Jan. 23, 2004
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Appellant's claimed invention is directed to a method of forming a phase shift mask. The method entails patterning an opaque layer on a transparent substrate to form a first region of the substrate of an uninterrupted rectangular surface. The first region is etched to create a phase shift region within the transparent substrate, and a second region of the transparent substrate is exposed by additional patterning of the opaque later. The second region comprises a similar shape and size as the first region and is adjacent thereto.

Appealed claims 21-23 stand finally rejected under 35 U.S.C. § 112, first paragraph. The appealed claims also stand finally rejected under 35 U.S.C. § 103(a) as follows:

- (a) claims 1, 3-5, 15, 17, 18, 24, and 26 over Dao in view of Schroeder,
- (b) claims 1, 3-5, 15, 17, 18, 24, and 26 over Dao in view of Schroeder and either Levenson, Rolfson or the Admitted Prior Art,
- (c) claims 8, 10-12, and 25 over Dao in view of Schroeder and Tzu,
- (d) claims 8, 10-12, and 25 over Dao in view of Schroeder, Tzu, and either Levenson, Rolfson or the Admitted Prior Art,
- (e) claims 21 and 23 over Dao in view of Schroeder and either Levenson, Rolfson or the Admitted Prior Art further in view of Sandstrom, and,
- (f) claim 22 over Dao in view of Schroeder, Tzu and either Levenson, Rolfson or the Admitted Prior Art further in view of Sanstrom.

We have carefully considered each of the arguments advanced by Appellant. However, we are in complete agreement with the Examiner's reasoned analysis and application of the prior art, as well as his cogent and thorough disposition of the arguments raised by Appellant. Accordingly, we will adopt the Examiner's reasoning as our own in sustaining the rejections of record, and we add the following for emphasis only.

At the outset, we will summarily affirm the Examiner's rejection of claims 21-23 under 35 U.S.C. § 112, first paragraph, since Appellant has not contested this rejection.

Concerning the § 103 rejections, there is no dispute that Dao, the primary reference in all of the rejections, discloses a method of forming a

phase shift mask comprising the claimed steps of forming an opaque layer on a transparent substrate, exposing a first region of the transparent substrate which is then etched to form a first opening, removing a second portion of the opaque layer to expose a second region of the transparent substrate such that the first region is enlarged (*see* reference Fig. 4A).

A principal argument advanced by Appellant is that "because Dao teaches regions comprising a rectangular ring having an intervening structure in the middle thereof, Dao teaches away from the claimed features 'wherein said first region comprises an uninterrupted rectangular surface . . . and . . . said second region comprises a similar shape and size as said first region'" (Br. 17, first para). However, in the words of the Examiner, the rejection "is not based on this particular rim PSM example of Dao et al. alone, but rather on other exemplary teachings of Dao et al in combination with Schroeder et al." (Ans., sentence bridging pages 18-19). As emphasized by the Examiner, Dao expressly discloses that "[t]he methods of the present invention are not limited to the specific rim or outrigger phase-shifting opening patterns shown in FIGS. 4A and 5A-E. The present invention may be used for any patterns having phase-shifting elements which are spaced in close proximity to other such patterns. For example FIG. 6 . . ." (col. 8, ll. 1- et seq.). PS region 42b of Dao is directly adjacent non-PS region 45a and have similar shapes and sizes (*See* Fig. 6).

Also, we are in complete agreement with the Examiner that Appellant's broad claim language "comprises an uninterrupted rectangular surface," encompasses Dao's Fig. 4A wherein first region 24 includes rectangular area 23, which "is itself an uninterrupted rectangular surface"

(Ans. 21, second para.). Hence, region 24 of Dao meets the claim recitation of comprising an uninterrupted rectangular surface, namely, surface area 23.

As for Appellant's argument that region 460 of Schroeder's FIGS. 6a and 6b "does not have similar size and shape as the region 458" (Br. 19, last para.), we observe that the claim language "similar shape and size" is broadly drafted and inexact such that it does not serve to distinguish over the referenced elements of Schroeder which, in our view, may be fairly considered similar. Moreover, as noted by the Examiner, Fig. 6a of Schroeder depicts regions 456 and 458 to have the same or similar size, as well as regions 454 and 460.

Regarding Appellant's argument that Levenson and Rolfson teach simultaneous formation of the first and second regions, the Examiner properly explains that Dao is cited for the obviousness of sequential, non-simultaneous formation of the first and second regions. Levenson and Rolfson are cited by the Examiner as evidence for the obviousness of having similarly shaped and sized first and second regions wherein the first region has an uninterrupted rectangular surface that lacks an intervening structure. In addition, we find that the appealed claims do not preclude simultaneous formation of the first and second regions inasmuch as the claimed step of "performing additional patterning" is sufficiently broad to embrace the additional patterning occurring during the first patterning step.

Concerning the Admitted Prior Art cited by the Examiner, Appellant's Specification states the following at paragraph [0018]:

Figures 1A-3B illustrate a methodology that is utilized to create a phase shift mask. This methodology is not necessarily well known; however, the invention is an improvement on this methodology.

Manifestly, it is not clear what constitutes the Admitted Prior Art in terms of what was known and what was well known and, unfortunately, Appellant has done nothing to clarify the record with respect to the nature of the prior art.

Appellant also maintains that since Tzu teaches that the phase shifting material 26 remains over the substrate 20 and the substrate remains unexposed, the reference "teaches against the claimed feature of performing a first patterning of said opaque layers to expose a first region of said transparent substrate . . . " (Br. 38, second para.). However, as set forth by the Examiner, Tzu is cited for teaching that forming additional third binary mask pattern regions that are devoid of PS features on the same transparent mask substrate having PS features increases throughput and decreases cost in the fabrication of integrated circuit wafers" (Ans. 37, penultimate para.).

Appellant also contends that "because Sandstrom teaches exposing the region 327 . . . by not patterning the layer 302, Sandstrom teaches away from the claimed invention" (Br. 62, second para.). However, the Examiner has cited Sandstrom as evidence that "one of ordinary skill in the art would have recognized that improving the uniformity of a PSM by further etching to attach the substrate during additional patterning to make the PSM (as taught by Sandstrom) would be reasonably expected to be just as advantageous for improving the uniformity in the combined method of making the PSM taught by the other references" (Ans. 46, second para.).

As a final point, we note that Appellant bases no argument upon objective evidence of nonobviousness, such as unexpected results, which would serve to rebut the inference of obviousness established by the applied prior art.

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In conclusion, based on the foregoing and the reasons well stated by the Examiner, the Examiner's decision rejecting the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(effective Sept. 13, 2004).

AFFIRMED

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